Part II:
Interoperability & Rural Fire Fighting
Q & A with Fire Chiefs Dave Mason & Bob Drake

Dave Mason is chief of the Baxendale Volunteer Fire Department west of Helena.
Bob Drake is chief of the Tri-Lakes Volunteer Fire Department that responds to incidents around Canyon Ferry Reservoir, Hauser Lake and Lake Helena.
They responded to e-mail questions asked by IM Public Affairs Officer Ian Marquand.

Q: Describe your overall experience with the Lewis and Clark trunked/interoperable system. Is it serving your needs today? What grade would you give it?

MASON: As with all major technological changes and advancements, we experienced growing pains and resistance to change. We had an old analog system that had been neglected, was obsolete (couldn't get parts anymore), and did not provide the coverage required by law enforcement or fire.

Several years ago all this was highlighted when two major fires broke out at once near Canyon Ferry Lake (Bucksnort Fire and Cave Gulch Fire) and we only had one repeated frequency (our main fire dispatch channel) that both law enforcement and fire could talk back to dispatch and the valley.

The Sheriff's office took the lead role in overhauling our antiquated system. An emergency services mill levy was passed by the public with a large sum of money reserved to put towards a new radio system. This money was wisely used by the county to help secure grants. RFPs were let out and Motorola was awarded the bid. The backbone was built and subscriber units procured with grant money and county funds.

Today, I have excellent radio coverage (100%) everywhere in my district (as compared to about 60% with the old system.) The system has evolved over the last couple of years to better handle the number of users but is still in need of more robust repeater sites.

I would rate our trunked system as a "B-."

DRAKE: Our overall experience is excellent! The transition process has not been without its trials but we have settled into a system that provides better coverage and more capabilities than we had before. We've never had it so good!

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For rural fire, we use a three tiered approach. We have the trunked tier that we use to talk with dispatch and our other mainly non-fire partners. We also use it for command when we are on a large incident in unified command. The second tier is repeated analog which we use for fire

department communication, mainly command and control, water supply when covering a large area, and for administrative traffic when cell phone coverage is not available.

This second tier is all of our old analog repeaters available before trunking plus two additional totally solar-powered analog sites and one analog repeater at each of the eight trunked sites (for a total of eight more.)

The third tier is the core of our communications plan which are all the analog statewide colored channels (i.e. red, gold, coral, etc.) This three tiered system works awesome as we choose the right "channel" for the job.

This system is serving our needs today and will continue to for the foreseeable future. I would give it an A- for a grade. The system does not exactly perform as advertised from Motorola. Our three tiered approach compensates for some pretty serious shortcomings of a trunked system if that was all you had.

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Q: How does your department use the system today? Who has a trunked radio, who gets to use them, and how do you govern that use?

MASON: Baxendale Fire initially issued the trunked radios to officers and EMS personnel only. Our EMS people often responded POV to non-trauma calls and I wanted them to be able to communicate with St. Pete's Ambulance and law enforcement.

The rest of the fire fighters were issued our old analog radios for fireground use as we switched from the trunked system to the statewide mutual aid fireground channels upon arrival at the scene. Now, since we were awarded an AFG grant for 20 additional radios, all department members are issued a trunked P25 radio after their initial probation period.

Training is conducted with the radio on its functions and the governance piece, i.e., when they are authorized to transmit (basically acknowledging pages if no officers have already acknowledged the page and arrival information if first on scene). They all know the radio will be taken from them if they are caught abusing the privilege.

DRAKE: Right now we use our trunked radio talk group to acknowledge the page to dispatch. The first unit in service talks to dispatch on the trunked radio talk group. The first unit on scene notifies dispatch on the trunked radio talk group. The last unit to clear talks to dispatch on the trunked radio talk group.

ALL other communication in the fire service (i.e. unit coordination, command, mutual aid, crew-to-crew, water supply, staging, etc.) takes place on either the analog repeated or line-of-sight analog channels just like it has for years. We really only use the trunked system to talk to dispatch, law enforcement, or the ambulance service.

For us in Lewis & Clark County, every radio we had before the change over was replaced with a digital trunked radio through a grant the County received. We did not have to pay to replace any of our radios. Unfortunately we did not anticipate the fall out of changing our paging system to a text based system from the old voice system. We did not realize that choice would require more and really all personnel to have radios since they can not get real-time updates on the text pagers.

Each department has had to cope with whatever state of affairs they were in prior to the change over. For those that had a lot of radios for their members, it has not been as big a deal.

For those that only had radios for their officers and relied on the truck radios and the voice pagers for the rest to stay updated, it has been a real challenging problem.

Our three tiered system compensates for this by allowing our officers, medical responders, and key personnel to have digital trunked radios and the rest of our responders to use the much cheaper analog radios since all our fire communications is done on analog channels. The cost to outfit all responders with digital trunked radios at $3000 each would be staggering.

Digital radios are given to those that need them to talk to dispatch. All truck radios are digital trunked so anyone that responds to the station or is in a truck has the ability to talk to dispatch. All other responders use analog radios to keep up to date.

Each department decides its own policy on who gets radios and all the departments, through the Rural Fire Council, decide what the appropriate use is for communications on the different tiers.

Q: How has your department's use of the system changed over the last 4 years? What are the most important lessons you have learned about using it?

MASON: Initially, all the fire departments stayed on the trunked system from page-out to completion of the response. We quickly learned that a robust response to a working fire and lots of transmissions overwhelmed the system (lots of Bonks.) Now, we are dispatched via the trunked system but upon arrival we switch to analog for fireground operations. We still monitor dispatch on the trunked system and one of the trunked incident channels (common command channels for the county) if assigned.

An important lesson learned: Be very discriminating about who you let use your system. Our county let non-emergency entities such as public buses and garbage services use the system to the detriment of emergency services. The agencies that you let on the system must have a buy-in, such as lots of money or frequencies to donate.

DRAKE: Rural fire's use of the system has really not changed all that much since inception. Through ACTIVE and VOCAL participation in the selection and implementation process, we learned the strengths and weaknesses of the system and put together a solid plan the first time.

The most important lessons are:
1. Trunked system is awesome for wide area roaming coverage. Law enforcement that roams all over the area loves that feature. For the fire departments, this advantage is good for talking to dispatch as you do that the same way everywhere in the area regardless where you are.
2. The trunked system is easily degraded by simply listening to the radio. Each trunked site has a limited number of repeaters available. If one of our fire fighters is simply sitting at home listening to a fire going on in Lincoln on the trunked system, they are using a local repeater to listen to that traffic. If 20 volunteers are sitting at home in
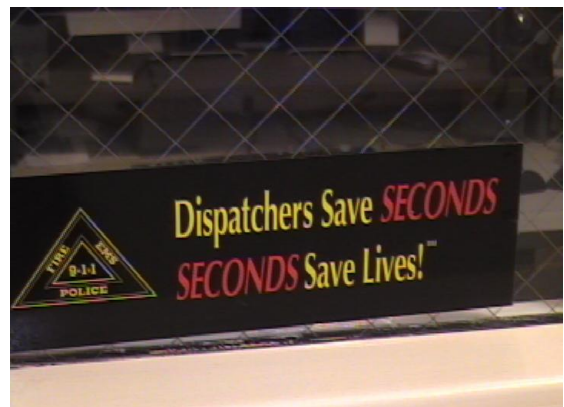
is paramount or these finite resources get used up very quickly.

3. Based on #2 above, build the system bigger (i.e. more repeaters than you think you need on each and every site) than you need. The site with the lowest number of available repeaters can cause the entire system to receive "bonks" or busies when all the other sites could handle the traffic.

4. Don't go out and "sell" the system to non-emergency users. For some stupid reason we let the Helena Valley Bus system on the trunked system and they never shut up. They were using over 8% of the system traffic and causing "bonks" or busies for emergency users. If you need their frequencies for the system, give them 800 MHz or some other system but don't let them on your emergency services system. You don't want to be competing with the bus when you NEED to talk to dispatch.

5. Don't give up your analog backbone you use now. You need it for non-wide area coverage and it functions as the backup for the trunked system when it is down for maintenance and other "unscheduled" down times.

6. Be active in the process. No one can represent you like you can. Don't expect someone from Law Enforcement or Public Works to look out for you interest. They don't know what you need, you do. Don't miss a meeting and don't be afraid to speak up when you see something not right going on. It has to work for everyone.

7. The cost of digital trunked radios is at least 4 times the analog equivalent. Plan for it, design your communications plan to allow for cheaper alternatives, and apply for grants. Our local departments have been very successful in getting Fire Act grants to get the digital trunked radios they need.

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Q: What kinds of problems did you have to overcome once you joined the county's system?

MASON: Lots of technical problems had to be worked through- mostly putting enough repeaters on sites to prevent overloading of the system. Also governance problems--who gets to use the system, how do you pay for maintenance, upkeep and expansion.

DRAKE: The main problem is capacity. Motorola designed a system to meet the budget and current use patterns. No one anticipated that when people COULD actually talk to each other that they WOULD. Traffic is substantially higher that they ever estimated because we can talk from anywhere in the County to dispatch and to each other.

Over-build because it won't be enough. In addition, the site with the fewest number of trunked repeaters is your weakest link. Simply because there never was a repeater on Nob Hill

and therefore there was little radio traffic from that side of town does not mean that a site with only two available repeaters will be enough. Especially when there are several bus stops near the hospital. Three repeater sites with one being using as the control channel only leaves two available and that is simply not enough for any size system.

We have worked through the problem in rural fire by driving all non-dispatch traffic off onto analog channels. We only have to compete with the dog catcher and the buses when we are talking to dispatch but not when we are talking to each other.

We have worked through the cost of radios by driving traffic to analog channels to allow us to utilize cheaper analog radios for less critical responders.

We have worked through capacity issues by educating out people on the consequences of being a "looky-lou" on the radio. Don't listen if you are not part of the solution.

We also limited access to the system to only certain sites for certain non-critical users. The buses can only access one trunked site to keep them off of the sites that have fewer repeaters thus limiting "bonks" or busies.

Q: Are there still ongoing problems?

MASON: If there are problems with the system now, they normally don't affect our day to day operations.

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DRAKE: Capacity continues to be a limitation and will be as long as we keep growing. We have added repeaters to certain sites and continue to plan on adding to other sites but the process is costly and takes a long time.

The other ongoing problem for rural fire is our paging system which is completely separate from the trunked system. The lack of a backup system if it goes down is aggravating. In addition there is no monitoring system to notify when there are problems so we find out by not getting paged. Not a good deal.

Q: Describe the strengths and weaknesses of the system from both the technical and operational perspective.

MASON: First, the strengths:
- Multitudes of talk groups, seamless roaming, great broad area coverage, ability to mix analog frequencies and digital talk-groups within all banks of the radio, encryption ability, fire fighter emergency alert.
- There are so many digital talk groups and analog frequencies that managing and organizing them is somewhat of a challenge but once you get that figured out and have a good matrix list developed that tells you what bank and channel number to go to--then it is fairly simple to navigate to the talk group or channel you need.

Now, the weaknesses:
- Scanning--unable to pick priority scan in mixed scanning mode (while scanning a mixture of analog and digital).
- Bonks occur when you are trying to transmit but the repeater is busy with someone else's transmission. Once you get bonked, then you must release the transmit button and listen for the "continue" chime before again depressing the transmit button again. This experience can be frustrating at first but it is not much different than waiting your turn to speak on a conventional system. In fact I would venture to say that it is probably more efficient because

you eliminate the possibility of several people "stepping on each other" as they transmit at the same time.

▪ Initial cost of the subscriber units (radios) is a weakness. It may be that just your command staff would be outfitted with digital trunked radios and the rest of the department could still utilize the existing analog radios.

DRAKE: Strengths – wide area coverage and seamless roaming are big strengths, especially for Law Enforcement and Public Works. One consistent method to contact dispatch no matter where you are simplifies training.

Weaknesses:

1. Capacity is limited by the way the system works and can be severely limited by non-essential listeners.
2. The cost of radios is a substantial limiting factor for rural fire departments.
3. Ongoing maintenance costs, which still have not been addressed in L&C County, are substantial and must be funded.
4. The system is complicated!!!!! Ongoing expansion, maintenance, training and business practice monitoring are critical to keep it working. Dedicated monitoring and maintenance personnel are necessary to keep it working.
5. Interdependent with all users. Other users can affect your performance.

Q: What should fire departments look for in radios to use on the IM system?

MASON: Look for full compatibility with your system. Don't take anybody's word for this--field test the radio to ensure it will work on your system. Obviously, if it is a Motorola system, then their radios will work. Don't fall for manufacturer's claims like "Our radio doesn't work on a trunked system yet, BUT we will have an upgrade soon!"
There are lots of options to choose from, but as always more options equates to more money! The encryption option might be something you can do without (law enforcement loves it) unless you transmit a lot of EMS info to your hospital or ambulance.

DRAKE: Probably not qualified to answer this. We received Motorola radios 2500s and 5000s and they have performed very well for us so far. They have been durable and have worked consistently. I have not seen or used anything else.

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Q: In general, what else do fire fighters and their supervisors need to know about trunking and interoperable radio technology?

MASON: All new technology has a steep learning curve and from my experience, most people are very resistant to change. There are some studies that claim digital radios don't work well under noisy conditions (chainsaws, PASS devices etc.). There are also choices to be made about VHF vs. 700 or 800 MHz. I would recommend keeping an open mind, visit systems similar to what you expect to be built in your jurisdiction. Talk to the users and the technical people that manage the system.

DRAKE: It is all above. It works, it works very well when used appropriately. As you can see from above, it is but one piece of our successful communications plan in L&C County.

Q: What would you say to those fire service leaders who still don't believe in the IM system?

MASON: Why wouldn't you want the increased capabilities from a trunked digital system in terms of seamless roaming, interoperability gained with all other users on the system and major gains in area coverage from a well designed system? Design the system to complement your existing system--not to replace it. Keep what you have--and utilize the trunked digital system to you and your customer's advantage.

DRAKE: What are your weaknesses and problems now? See if the system addresses them. And remember, this is an additional tier to what you already have--not a replacement. In addition, talk to fire people that have experience with the system and can address directly some of the BS that is going around. There are technical challenges that make trunked radio communications not the right choice for every communications need on the fireground. It is ONE tool available in the arsenal.